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ABSTRACT

A study will be conducted to determine if the learning style of field dependence/independence has any effect on the cognitive outcomes and attitudes of students in a distance education class. The instructional strategies of group and individual learning will be compared to see which one results in greater learning and which one students prefer and enjoy most when learning at a distance. Quantitative data will be gathered from two sources: a criterion referenced test of the instructional content and a Likert scale measuring attitudes, satisfaction, and preferences toward instructional strategies. Both of these tests will be given before and after the study to assess any change in learning and attitude. Subjects will be volunteer college undergraduate students. The Group Embedded Figures Test (GEFT) will be used to determine their level of field dependence at the beginning of the study and the students will be randomly assigned to one of two treatment groups. The first group will receive the instruction in small groups of four students; each group will function as autonomously as possible with the teacher operating only as a facilitator. The second group will receive the same instructional materials and objectives but students will work on the materials individually, and the teacher will facilitate and answer questions as they arise. All of the instruction will be delivered at a distance using two-way video and two-way audio media. This paper concludes with four research questions and three hypotheses that will be examined and a discussion of the implications of this research. (50 references) (BBM)

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Distance Education and Learners' Individual Differences: An Examination of Different Instructional Procedures Designed to Accommodate the Learning Characteristics of Field-Dependent and Field-Independent Learners

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Distance education and learners' individual differences: An examination of different instructional procedures designed to accommodate the learning characteristics of field-dependent and field independent learners.

Learning is a complex process. In educational settings learning is the product of the interaction of teacher, student and instructional content and the environment (Keefe, 1987). Each of these complex elements has wide variation and that variation allows for accommodations to the teaching and learning process. Each of these aspects contributes something to the existing knowledge of learning and teaching. Even though each of these has been extensively investigated, much remains to be discovered about the learning process and how it can be optimized.

Due to the noncontiguous nature of distance education with its physical separation of teacher and students (Keegan, 1980) certain issues common to many educational contexts become exaggerated and therefore provide unique opportunities for examination (Calvert, 1988). This separation of teacher and students leads to concerns regarding the interpersonal relationships between the teacher and the students and the effect on cognitive achievement. Perhaps singling out one of these characteristics and examining it in a specific context, the distance education classroom, would have practical applications for learning and instructional theory for other areas of educational concern. Characteristic differences in cognition shape individual learning and performance and therefore have implications for teaching and learning.

It has been suggested by some educators that individual differences are a valid focal point for school reform and restructuring. In a learner-centered school setting there is apt to be attention given to individual learning styles (Keefe, 1987). Evidence can be found in recent research that the individual differences in learning style that the learner brings to any learning situation is worthy of examination (Ausburn & Ausburn, 1978; Burger, 1985; DeBasio, 1986; Halpin & Peterson, 1986; Harris, 1987, in Calvert, 1988; Moore & Bedient, 1986; Moore & Dwyer, 1991; Wieseman & Portis, 1990). Individual differences do make a difference!

Learning Styles

The concept of learning style is a basis for understanding the ways students learn (Keefe, 1987). Knowledge of cognitive styles, one aspect of total learning style, influences how students learn, how teachers teach, and how teachers and students interact (Kogan, 1971; Witkin, Moore, Goodenough, & Cox, 1977). Understanding student learning leads to consideration of the teaching and learning environment and that proceeds logically to educational improvement. The value of including learning styles in the instructional design of school curricula is that information about learning styles provides a more extensive profile of the learner beyond information that comes from knowledge of the student's IQ, aptitude test scores, and grade average (Messick, 1984; Keefe, 1987). In this manner educators can get a comprehensive assessment of the student and this is one of the important first steps in the instructional design process (Dick & Carey, 1985; Gagne, 1985).

Learning style refers to the way people absorb, process, and retain information (DeBello, 1990). Everyone has a preferred learning style and that style makes the same teaching method effective for some and ineffective for others (Dunn, Beaudry & Klavas, 1989). Learning styles are thought to be pervasive and consistent indicators of personal preferences. According to the National Association of Secondary School Principles learning styles are the "characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (Keefe, 1987). Cognitive styles are information-processing habits; affective styles, motivationally-based processes; physiological styles, biologically-based responses. Learning styles have also been separated into environmental, social, emotional, and physical categories. (Dunn & Dunn, 1978).

Cognitive styles are information processing habits a learner uses to perceive, think, problem solve and remember (Messick, 1984). The cognitive style characterizes the person and continues to do so in a way that is stable over time (Manning, in Wapner & Demick, 1991). It was out of the individual-differences branch of cognitive-style research that the study of perception focused on what came to be known as cognitive styles or cognitive controls (Witkin & Goodenough, 1981). The term cognitive came to be used because the style is pervasive across both perceptual and intellectual activities.

A careful search of the literature reveals more than 20 dimensions of cognitive style to be found in experimental research. These can be further categorized into reception or concept formation styles. Some of the reception styles are: perceptual mode preferences, field independence/dependence, scanning, constricted vs. flexible control, tolerance for incongruity, automatization, conceptual vs. perceptual styles. The concept formation styles include: conceptual tempo, conceptualizing styles, categorizing, complexity vs. simplicity, and leveling vs. sharpening (Keefe, 1987).

The other two aspects of learning styles are the affective and physiological dimensions. The affective dimension includes these constructs: curiosity, persistence, anxiety, frustration, locus of control, risk-taking, self-efficacy, and self-actualization. Styles related to affective emotional aspects take into account an individual's motivation, self-confidence, persistence, need for structure and guidelines, and autonomy and self-directedness.

The third dimension, the physiological styles, include biologically based aspects such as: time-of-day, sex-related behavior, need for mobility, and environmental factors (Keefe, 1987). Included here are the visual, auditory, tactile and kinesthetic styles familiar to most people. Styles related to environmental elements refer to an individual's comfort level with the surroundings, such as the lighting level of the room, how much noise can be tolerated or is preferred, and ergonomic considerations like seating comfort.

Field Dependence

Of all the above mentioned cognitive styles one has many features and characteristics that make it especially suitable to be singled out for this study: field dependence/independence. There are several reasons for this suitability. The cognitive style of field dependence is probably the most researched cognitive style which gives a strong foundation upon which to draw conclusions. The great research activity in field dependence and independence can be attributed in part to its breadth and to its real, visible manifestations in everyday life. One of the outcomes of the research on field dependence over the years is the theoretical framework for recognizing the connectedness of psychological phenomena and functions previously not thought to be related (Witkin & Goodenough, 1981). The evolution and growth of the science of educational psychology is an ongoing, dynamic process. In this process new evidence emerges which is added to the present body of knowledge so that new principles are formed and new theories are offered. In this way phenomena which were observed many years ago take on fresh perspectives when they are linked to previously unrelated contexts. In addition to these reasons there exist effective and relatively easy methods to assess the presence of field dependence (Witkin & Goodenough, 1981). Field dependence is a measure of a cognitive style approach which brings an individual differences perspective to the experimental study of social interaction (Bertini, Pizzamiglio, & Wapner, 1986).

The concept of field dependence evolved from research during World War II which was searching for a way to determine pilots' aptitude for visual and spatial orientations. In those days the way field dependence was measured was to place the subject in a chair that was tilted relative to gravity in a darkened room. In front of the chair was a rectangular frame and a cylindrical rod. The frame was also reoriented so that it was out of alignment with gravity. The subject was to align the rod up to his perception of uprightness. Whether the subject could align the rod so that it was upright regardless of its relativity to the frame or whether the subject would align the rod with the frame which appeared to be upright is indicative of the subject's ability to orient physical objects. The field dependent person relies more on the visual environment to make a judgment as to

the verticality of an object whereas the field independent person orients the rod to a vertical position regardless of the outward appearance of the rod and frame (Wapner, S. & Demick, J.1991; Witkin, H., Moore, C. A., Goodenough, D. R., & Cox, P.W.,1977).

Researchers noticed that subjects have a preferred way of integrating the many sources of information from the environment that contribute to cognitive decisions. Differences among subjects' preferences emerged. And they noticed that people tend to use that same frame of reference consistently to integrate information across a multitude of tasks (Witkin & Goodenough, 1981). This ability was later related to an ability to separate an item from an organized field which led to both the definition of field dependence and to other methods of measurement. Years of experimental research attempts have yielded the conclusion that these modes of establishing the upright depends on referral either to the body's position or to the external field. Hence the designation of field dependence for those who refer to the external visual field to determine upright and field independence for those who refer to their body position.

Field dependence is a capacity to overcome or analyze embedded contexts in perceptual functioning. Field dependent and field independent subjects differ in how they perceive the difference and not in how accurately they perceive. The intent of Witkin's original research was that field dependence and independence exist along a continuum. That is, there is no clear cut labelling; subjects only demonstrate more or less field dependence. At the field dependent end of the continuum subjects exhibit global behaviors. The less field dependent end of the continuum manifests behaviors that are specific and articulate.

Subjects who are classified as field dependent rely more on visual cues in order to make decisions about the environment. They are more socially oriented, attentive to interpersonal cues, have a preference to being physically close to others, express emotional openness in communication with others, rely more on information that is perceived to come from the world of objects and people around them. They depend on external referents to achieve solutions. They have greater interpersonal competencies; are more at home with people because they need other people to provide them with standards (in ambiguous situations) for judgment and action. They are likely to have professional lives involving the humanities, the social sciences, and the helping professions (Bertini, Pizzamiglio, & Wapner, 1986). They also tend to be influenced by authoritative opinion. Furthermore field dependent people may need detailed instructions from the teacher in problem-solving strategies and explicit explanations of performance outcomes (Witkin, 1977).

Subjects classified as field independent have a more abstract, impersonal orientation. They demonstrate greater physical and emotional distancing. They ... action with a greater degree of autonomy in inter-personal behaviors. They use internal referents to restructure the universe. They prefer relatively impersonal situations and maintain greater psychological and personal space from others (Greene, 1976). They are less likely to require detailed explanations and more likely to work with less guidance than are field dependent student. They show greater skills than the field dependent subjects in cognitive restructuring. They tend to choose vocations in the sciences and mathematics and favor isolation, intellectualization and projection over social integration of information.

In summary a personality theory has evolved from the observations and findings of the psychology of field dependence: field dependence/independence is a process variable describing ways of orienting and functioning and not the success in attaining goals; it describes pervasive dimensions of individual functioning; it is self-consistent in behavior and is predictable across situations; it is stable over time; one is not the absence of the other, instead it is bipolar with one end having distinct different competencies than the other; each pole has qualities that help people adapt under particular circumstances; it is value neutral.

Research Background of Field Dependence

The construct of field dependence is not related to some other constructs which at first seem to be related. For instance numerous studies have found field dependence is not related to the attitudinal construct of locus of control (Witkin, H. & Goodenough, G.1981). Field dependence is a process variable describing the individual's ability in information assimilating processes to separate self and non-self. Locus of control is an attitudinal or belief variable representing the individual's perception of the amount of personal or external control over life results. Field dependence has also been found to be unrelated to the cognitive styles of extraversion/introversion and impulsivity/reflexivity (Roodin, Broughton, & Vaught, 1974; Shapson, 1973; Tobacyk, Broughton, & Vaught, 1975, in Witkin & Goodenough, 1981, p. 48).

The theory asserts that the outcome of learning does not differ for the two types of learners but the procedures used in their learning may differ (Wapner & Demick, 1991). This theoretical position raises questions relevant to the educational implications of field dependence. These questions address the issues of how field dependence is related to academic achievement and how different instructional procedures accommodate the individual learning differences between the two types of learners. A common approach to adapting instructional strategies to the individual learner employs aptitude-treatment interaction (ATI) (Cronbach & Snow, 1969). In this method the teacher uses different strategies for each type of learner to see if there is an interaction between the learner's aptitude and the treatment. The instructional strategy is designed to complement the learner's preferred method of learning. The goal of ATI research is to identify which learners will learn best when taught one way, and which learners possessing an opposite trait may learn best in a different way. Such an investigation may reveal the importance of matching students' learning styles and instructional methods (Jacobs & Gedeon, 1982).

While previous research has yielded conflicting and inconclusive results, some important and substantive findings have emerged. Some studies have reported no differences in students' achievement for their cognitive style, the treatments they received or any interaction of the two (Canino & Cicchelli, 1988; Grippen & Ohmacht, 1977; MacNeil, 1980; Njus, Huges & Stout, 1981).

Other studies found that field independent students achieved higher scores than field dependent students no matter which treatment they received (Carrier, Davidson, Higson, & Peterson, 1984; Carrier, Joseph, Krey, & LaCroix, 1983; Frank, 1984; Halpin & Peterson, 1986; Kiewra & Frank, 1988; Provost, 1981; Smith & Standal, 1981; Strawitz, 1984a, 1984b; Thornell, 1977; Threadgill, 1979).

Some studies found significant interactions with field dependence and instructional treatments (Abraham, 1985; Douglass & Kahle, 1978; Kiewra & Frank, 1986; McLeod & Adams, 1979; McLeod, Carpenter, McCormack, & Skvaricius, 1978; Satterly & Telfer, 1979; Threadgill-Sowder & Sowder, 1982). In the study by Satterly & Telfer, (1979), the interaction reflected differences in achievement between cognitive style groups for one treatment or differences in achievement between treatments for one cognitive style group.

The study by Abraham (1985) is the only one which found a disordinal interaction that showed equal levels of achievement for the cognitive style groups receiving different instructional treatments. In this study foreign students learning to use participle phrases in either a deductive or example-instructional treatment achieved best when their cognitive style was matched with the instructional treatment best suited for that style. Other studies which claim disordinal interaction (Douglass & Kahle, 1978; McLeod & Adams, 1979; McLeod, Carpenter, McCormack, & Skvaricius, 1978; Threadgill-Sowder & Sowder, 1982) seem to show that when there was significant interaction the field independent students respond more to variations in instructional manipulations.

As shown from the above research results it is difficult to reach definitive conclusions. The instructional treatments in many of the studies varied the level of structure to correspond to the theoretical notion that field dependent students prefer and achieve best in a more structured learning environment and field independent students prefer and achieve best in a less structured learning environment. Results do not show

this to be true in all cases. Often the effects of the cognitive style overcomes the instructional treatment and one cognitive style performs best regardless of the instructional treatment. Much needed research may bring more conclusive results.

Distance Education Research

Research in distance education in the 60's and 70's was mainly concerned with management, administrative and global descriptive theory building (Coldeway, 1988; Holmberg, 1990; Moore, 1985). With the increased demand in educational needs for adult education and the addition of new communication technologies educators became interested in building and maintaining enrollments. Much of the research was aimed at the practical, organizational aspects of distance learning in the world. In the last two decades a new trend in distance learning research has appeared: the application of scientific research methods to attempts to investigate the commonalities of existing educational research with the emerging field of distance education research (Coldeway, 1988). Also, theorists are beginning to contribute to a theory of distance education (Moore, 1973 & 1977 in Holmberg, 1990). With this new emphasis the importance of methodologies of research emerges. In distance learning the instructional content is conveyed from teacher to student through some medium such as satellite, telephone lines, microwave, computer connections and regular mail. With the evolution of new technologies distance education has grown and changed from the early days of correspondence study that once identified distance learning. There are many more opportunities to design and use interactive strategies in the instructional curriculum of distance education than there once was. Since modern distance education is a departure from the norm as far as educational contexts go, it offers an opportunity to apply research questions to a different environment. In this way the body of knowledge can be expanded by including a nontraditional context in the research literature.

Characteristics of learners, such as the need for interpersonal contact, the ability to work in an unstructured environment and satisfaction with the educational experience, characterize success in the distance education classroom and are learner attributes that are often studied in traditional classrooms (Riddle, 1992). Other important aspects of individual preferences worthy of investigation are: self-directedness and autonomy, need for a structured learning environment, and comfort with and preferences for working individually. Perhaps by singling these issues out and examining them in an environment where their presence is emphasized inferences can be made that generalize to other educational settings.

Design of the Study

A study will be conducted to determine if the learning style of field dependence/independence has any effect on the cognitive outcomes and attitudes of students in a distance education class. This research study is an examination of characteristics of learners and the kinds of instructional strategies used. This study will compare the instructional strategies of group and individual learning to see which strategy results in greater learning and which strategy students prefer and enjoy most when learning at a distance. Quantitative data will be gathered from two sources: a criterion referenced test of the instructional content presented during the study and from a Likert scale measuring attitudes, satisfaction, and preferences toward instructional strategies in a distance learning class. Both of these tests will be given before and after the study to assess any change in learning and attitude.

Subjects will be volunteer college undergraduate students. The pool of potential volunteers will be 235 students in four sections of an undergraduate class, (a section is the same class taught at different times). The subjects will be tested early in the semester before the study begins with three instruments. The first is the the Group Embedded Figures Test (GEFT) given to determine their level of field dependence. The (GEFT) is a

paper pencil test composed of simple figures hidden within a field of complex figures. The timed test contains complex figures divided into two 5-minute testing sessions. One of eight simple forms is embedded in each complex figure. The subject is asked to trace only one simple form in pencil over the lines of the test booklet. The purpose of the (GEFT) is to assess an individual's perceptual differentiation. A person with greater differentiation typically scores above the median (9) and a person of lesser differentiation typically scores below the median (Witkin , 1971). The split-half reliability coefficient of the GEFT of 332 subjects with the Spearman-Brown correction was estimated at 0.89 (Burkhalter & Schaer, 1985).

The second test will be the criterion-referenced multiple choice pretest which is a test of their mastery of the content presented during the study. The test will be developed and then reviewed by subject matter experts, college professors who teach at a distance. The third test will be the Likert Scale which is a self-report instrument assessing their attitude and satisfaction about learning in groups or individually, being an active participant in their learning, their comfort level with being separated from the teacher, and their confidence in receiving the same instruction at a distance as they would have in a traditional class. This scale was developed and pilot tested by this researcher on 198 college students subjects and found to have a reliability coefficient of 0.75. (This test was developed using the expertise of an evaluation and measurement expert. This test was also reviewed by subject matter experts, college faculty members who have expertise in distance learning.)

At the beginning of the semester the students will be randomly assigned to one of two treatment groups by dividing the class role into two halves. The first treatment group will receive the instruction in small groups. A small group will consist of four students. The small group will function as autonomously as possible. They will be given a packet of instructions which will be designed to be self-explanatory. The teacher will operate as a facilitator only, answering questions as needed but encouraging the students to work together to reach the stated objectives. The second group will receive the same instructional materials and objectives as the small group treatment receives. This group will work on the materials individually. The teacher will facilitate and answer questions for students as they arise. The lesson plan, the objectives and the teacher will be the same for both groups. The difference will be that the students in the group will be able to work together to accomplish the objectives of the instructional module, and the students who work individually will not receive assistance from their fellow students. The instruction will take place over 2-3 class periods.

All of the instruction will be delivered at a distance by using two-way video and two-way audio media so that students and teacher can see and hear each other. At the end of the sessions all students will take the same test, that was given before the start of the study. In addition to the criterion-referenced test students will complete the Likert scale instrument again.

Research Questions

This study will examine the following research questions:

1. Field dependent students will show greater gains from the achievement pretest to the achievement posttest test in the group treatment than in the individual treatment.
2. Field independent students will show greater gains from the achievement pretest to the achievement posttest test in the individual treatment than in in the small group treatment.
3. Field dependent students report that they prefer group learning instruction and actually achieve better in the group learning treatment.
4. Field independent students report that they prefer individual learning and actually achieve better in the individual learning treatment.

This study will examine the following hypotheses:

There is no significant difference in the change scores of field dependent and field independent students from the criterion-referenced pretest to the criterion-referenced posttest.

There is no significant difference in the change scores of field dependent and field independent students on the pretest Likert scale assessing preferences for instructional strategy, need for interpersonal interaction and confidence with being in a distance learning class and the posttest Likert scale.

The differences in means for the four groups, field dependent in the small group treatment, field dependent in the individual treatment, field independent in the small group treatment, and field independent in the individual treatment, will be analyzed for any significant differences by using an analysis of variance. This research is ongoing and as such data is not available about the results of the study. Data from this research will be available to interested parties upon request.

Implications for Distance Education and Traditional Education

In distance education contexts, much research on individual difference factors needs to be done (Calvert, 1988; Coldeway, 1988). Some benefits of learning style research specifically for distance education include guiding the goals of the distance learning class, predicting the success of learners, allowing for selection of learners, designing courses more specifically for learner needs, having indicators as to the type and quantity of interaction between teacher and students, and offering learners opportunities to use strategies other than their preferred strategies to become more versatile in their learning behaviors (Ehrman, 1990; Thompson & Knox, 1987).

Knowledge of students' cognitive styles not only has relevance about individual learning but also about the nature of teacher-pupil interactions and of social behavior in the classroom (Messick, 1984). Educational research has shown that cognitive styles influence how students learn, how teachers teach, and how teachers and students interact (Witkin, Goodenough, & Cox, 1977). The knowledge of cognitive styles has value for education by identifying personal characteristics that may interact with instructional treatments that mediate learning, retention and transfer; as diagnostic tools for prescribing interventions; and by promoting the learner's flexibility (Messick, 1984). Results of research on individual differences have relevant applications to other learning settings so long as practitioners remain aware of the interdependence of individual differences, social and environmental factors, and learning outcomes.

Understanding the importance of learning styles to education leads to an expectation of the impact they have on the teaching/learning environment. Cognitive styles might provide an opportunity to tailor the mode of presentation to the characteristics of the student; improve the communication between teacher and student when teachers become aware of student's style variations; expand student thinking and learning strategies; extend educational goals to include not only knowledge acquisition but also student's manner of thinking (Messick, 1984). Scores on an achievement test don't give enough information about a student. More information is needed. Investigations into how students learn can provide even more information for the total picture of the teaching/learning environment.

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